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EIGHT NEW *ASHMUNELLAS* FROM THE
SOUTHWESTERN UNITED STATES
(PULMONATA : POLYGYRIDAE)

BY JOSEPH VAGVOLGYI

*Staten Island Community College,
Staten Island, New York 10301*

INTRODUCTION

During the summers of 1967 and 1968 a search was made for *Ashmunellas* in the low mountains of Arizona, New Mexico and Texas. These mountains had been studied previously by very few malacologists, presumably because their barren appearance discouraged potential collectors. The mountains are deceptive, however, for many sustain land snail communities in protected canyons, rock slides or near the peak areas. Among the many species of land snails found, 8 forms of the genus *Ashmunella* proved to be new to science. Description of these forms and a critical reexamination of the taxonomy of several related *Ashmunella* species follows.

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TERMINOLOGY

The measurements and symbols used in this paper are explained in Fig. 1.

DESCRIPTIONS

The descriptions start with that of the nominal subspecies of *Ashmunella kochi*. Its description is necessary to provide a comparative basis for the descriptions of three new subspecies of *A. kochi* which follow, and to allow a more meaningful discussion of their relationships.

Ashmunella kochi Clapp

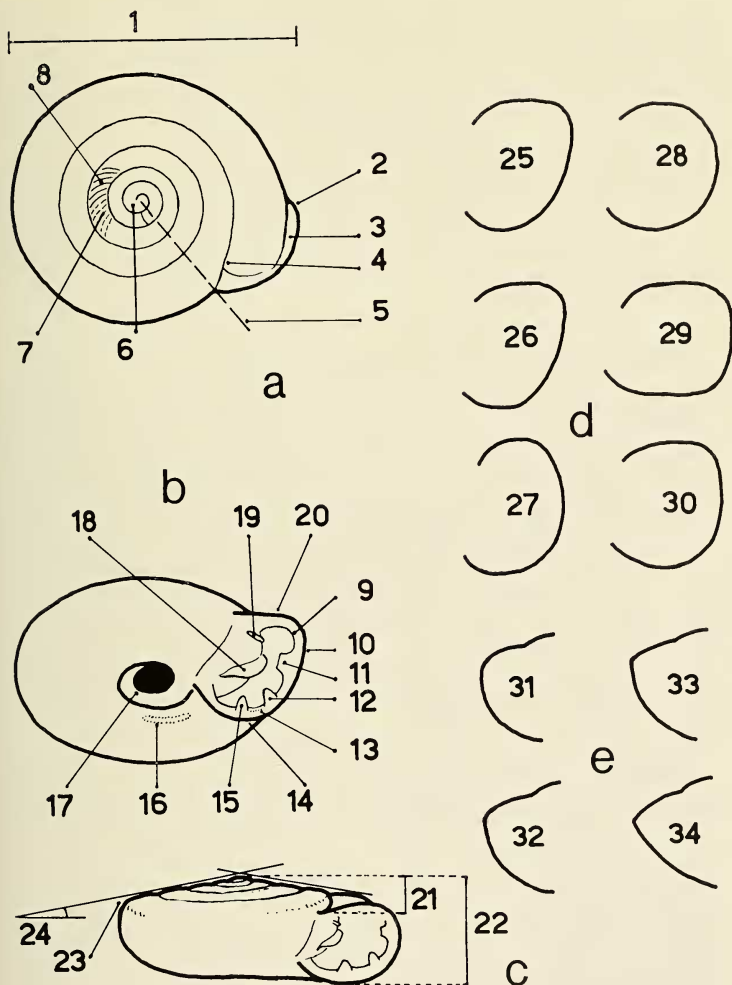
Ashmunella kochi kochi Clapp

Plate I, Figures 1, 1a; Figure 4a

Ashmunella kochii Clapp, 1908: 77, pl. 8, figs. 1-3. Black Mountains, San Andres Range, Doña Ana County, New Mexico. W. E. Koch. This locality appears erroneous, see discussion of distribution below.

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FIG. 1. Terms and standards of description. a, Shell in top view. 1, width; 2, reflected lip; 3, constriction or furrow behind lip; 4, ascending portion of last whorl; 5, whorl number; measured under dissecting microscope, using circular scale divided into 10 parts, apex of the shell pointing upward and being held in the center of scale; shell shown has 5.4 whorls; 6, embryonic shell; shell shown has 1.5 embryonic whorls; 7, granules, arranged in regressing radial rows; 8, striae, regressing radial in direction. b, Frontal view, shell tilted. 9, lip swelling; 10, outer lip; 11, outer lip tooth; 12, outer lamella of lower lip; 13, spout between outer and inner lower lip lamellae; 14, lower lip; 15, inner lamella of lower lip; 16, fulcrum or inner lamella, inside of shell; 17, umbilicus; 18, lower parietal lamella; 19, upper parietal lamella; shell shown has medium



thick lip swelling, wide and medium high outer lip tooth, medium large lower lip lamellae, long fulcrum, medium large lower parietal lamella and small upper parietal lamella; 20, upper lip. c, Frontal view, shell held horizontally. 21, spire; 22, height of shell; 23, left shoulder of last whorl; angularity of last whorl measured here, shell shown is rounded; 24, elevation of spire; (shell shown has 10° angle = flat) 7.5° – 22.4° = flat, 22.5° – 37.4° = moderately elevated; d, Aperture shape. 25, triangular; 26, auricular; 27, standing oval; 28, round; 29, rectangular; 30, angular; all but 29 round below. e, Angularity of last whorl, measured at left shoulder. 31, rounded; 32, slightly angular; 33, angular; 34, keeled.

George H. Clapp Collection, Pittsburgh, Pa. Lot labelled "Topotype, original lot [probably paratype]," ANSP 97640, 2 specimens, examined. *Ashmunella kochi* Clapp.—Pilsbry, 1940: 976, figs. 566a–c.

Ashmunella kochi ambly Pilsbry, 1940: 977, fig. 566d. Pine Spring Canyon, Guadalupe Mountains, Culberson County, Texas. Type ANSP 164659, 1 specimen, examined.

Definition: *Ashmunella k. kochi* as defined here includes the current *A. k. kochi* and those populations of the current *A. k. ambly* which live in the Guadalupe Mountains, but excludes those living in the San Andres Range. The latter are considered a separate subspecies, *A. k. sanandresensis*; see below.

Material examined: 7 samples, 1–30 specimens each, 77 specimens altogether, from the ANSP and my own collection.

Description of shell: *Size and Shape:* Width 15.9–21.5 mm; spire flat and only very slightly convex or plane in contour; apex sometimes so depressed that it is level with right shoulder of last whorl when shell is held horizontally; height of shell 5.6–7.9 mm, height–width ratio, 0.30–0.40; last whorl slightly angular or angular on left shoulder, slightly or not at all ascending and then briefly but abruptly descending before aperture, constricted by a deep furrow behind outer and lower lips.

Growth pattern: The 4.9–5.7 whorls first increase gradually, but last whorl expands suddenly, particularly in larger specimens (Fig. 2b); coiling usually looser than average, whorl–width ratio, .25–.34; embryonic shell has 1.4–1.6 whorls.

Umbilicus: Narrow at beginning but becoming suddenly wider in last half of last whorl, diameter here reaching 4.0–7.1 mm; umbilicus–width ratio varies from .24 to .34.

Aperture: Angular to triangular—auricular above, round below; its plane slanted down and backward, somewhat concave when viewed from side; outer and lower lips reflected; lip swelling medium thick to thick, receded in upper lip, marginal in outer and lower, thus upper lip appears sharp, outer and lower, round.

Armature: Consists of 6 elements as follows: outer lip tooth, outer and inner lower lip lamella, upper and lower parietal lamella, and fulcrum (lamella deep inside of last whorl near umbilicus). Outer lip tooth medium high and variable in width, moderately or deeply receded and slanted down and inward; 2 lower lip lamellae medium large or large, outer one usually larger than inner one, lip swelling usually protruding between them to form a little spout; upper parietal lamella present in traces or completely absent, lower large and long; fulcrum moderately to well developed, $\frac{1}{2}$ to $\frac{1}{4}$ of a whorl in length.

Sculpture: First whorl of embryonic shell smooth except near suture where it bears short radial striae; rest of embryonic shell covered with fine striae, some of which break up into rows of fine granules; this pattern persists for 1 or 2 more whorls, after that granules gradually disappear and striae become more widely and irregularly spaced.

Reproductive anatomy: As characteristic of *Ashmunella*, the sperma-

theca is long, cylindrical, without a terminal widening; the epiphallus is long, and the flagellum, vestigial (Fig. 4a). Three internal ridges run through the entire length of the epiphallus (see cross sections). All is in essential agreement with Pilsbry's drawing of the genitalia of *A. k. ambly*a (1940: 916, from Pine Spring Canyon, Guadalupe Mountains, Texas). However, in my specimen the penial retractor is only attached to the penis and that region of the epiphallus next to it, whereas in Pilsbry's it is also attached to a point farther above on the epiphallus. The difference may be due to individual variation.

Taxonomy: *Ashmunella k. ambly*a of Pilsbry is combined with *A. k. kochi* because their types are inseparable in shell features such as width, height, umbilicus, whorl number, apertural characteristics, etc. (Figs. 2a, 2b).

Distribution and ecology: *Ashmunella k. kochi* is restricted to the Guadalupe Mountains of Texas (Fig. 3). We found it in a very narrow and deep branch of Pine Spring Canyon, on the northern slope of Guadalupe Peak (8,751 ft.), at about 6,800–7,000 ft. of elevation, about 3 mi. west of Pine Spring. There was a nice stand of oak in the canyon. In spite of the heavy rains that fell prior to our visit, we only could find 20 live adult specimens in 4–5 hours of search. The snails were hiding under rocks and logs. Pilsbry described some of the localities he collected at in the area as "dry, stony hills," "terraced butte on dry canyon," etc.

The type-locality of *Ashmunella k. kochi* reportedly lies in the Black Mountains, San Andres Range, New Mexico. This locality appears erroneous for the following reasons. First, the type-specimens of *A. k. kochi* most closely match the types of *A. k. ambly*a, reportedly collected in Pine Spring Canyon, Guadalupe Mountains, which appear authentic because they match other populations collected in that same mountain range. Second, populations of *A. k. kochi* other than the types do not occur in the San Andres Range; they seem only to occur in the Guadalupe Mountains. Third, in the San Andres Range, of which Black Mountains are a part, another subspecies of *A. k. kochi* occurs, *A. k. sanandresensis*; this subspecies differs significantly from the types of *A. k. kochi*. Fourth, another subspecies, *A. k. cornudasensis* occurs in the Cornudas Mountains, which lie halfway between the areas of the two subspecies in question (Fig. 3), which fact makes it unlikely that *A. k. kochi* could occur in identical forms at both ends of the range. All these considerations seem to indicate to me that the types of *A. k. kochi* do, in fact, come from the Guadalupe Mountains, not from the San Andres Range as accepted today. But until further studies I leave the status quo unchanged.

***Ashmunella kochi cornudasensis*, new subspecies**

Plate I, Figures 2–2a; Figure 4b

Holotype USNM 701251, deposited in the United States National Museum of Natural History, Washington, D.C. Paratypes in the collection of the author. Type-locality: Wind Mountain, Cornudas Mountains, Otero County, New Mexico.

Material examined: 1 sample, 3 specimens altogether, from my own collection.

Description of shell: *Size and shape:* Width of shell 17.9–18.2 mm; spire flat or moderately elevated, very slightly convex or plane in outline; height 7.4–8.1 mm, height—width ratio 0.41–0.45; last whorl angular at left shoulder, descending briefly before aperture, constricted by a deep furrow behind outer and lower lips.

Growth pattern: The 5.3–5.4 whorls widen gradually; coiling is loose, whorl—width ratio varies from 0.29 to 0.30; embryonic shell has 1.4–1.5 whorls.

Umbilicus: Very narrow at beginning, almost point-like, widening suddenly in last part of last whorl; umbilical diameter here is 3.8–4.2 mm, umbilicus—width ratio, 0.21–0.23.

Aperture: Auricular or angular above, round below, its plane concave and strongly slanting down and backward in side view; outer and lower lips reflected; lip swelling medium thick, receded from edge of lip above outer lip tooth, marginal below it, therefore former region appears sharp, the latter, round.

Armature: Consists of same elements as in nominal subspecies; outer lip tooth medium large, wide, receded and slanted down and inward; 2 lamellae on lower lip medium large, outer usually stronger than inner; lip swelling forms a spout between them; lower parietal lamella medium high and long, upper, very weak and short; they converge inward but do not fuse at their inner end; fulcrum moderately large.

Sculpture: Embryonic whorls smooth except below suture where very fine, short striae are visible; postembryonic whorls bear a fine striation.

Reproductive anatomy: Reproductive organs essentially as in *Ashmunella k. kochi* (Fig. 4b) except that spermatheca is somewhat shorter and penial retractor is attached to epiphallus both near penis and at a point farther above; when the retractor contracts, it throws the lowest section of the epiphallus into a loop. Also, a minor ridge is noticeable in cross sections of the middle epiphallus beside the 3 major ridges, and the penis has much thicker walls and smaller ridges than in nominal subspecies.

Similarities and differential diagnosis: *Ashmunella k. cornudasensis* closely resembles *A. k. kochi* in apertural features and armature. Its higher spire, narrower umbilicus and angular last whorl clearly differentiate it, however, from that subspecies (Table 1). In the angularity of the last whorl it resembles *A. b. mudgei*; this appears to be a superficial parallelism, however, because the growth pattern and the apertural features are very different in the two forms.

Name: The name *cornudasensis* refers to the Cornudas Mountains where the subspecies was found.

Distribution and ecology: *Ashmunella k. cornudasensis* is a geographic isolate of *A. kochi* (Fig. 3). It is only known from Wind Mountain, Cornudas Mountains, New Mexico, about 18 mi. north of Cornudas, Hudspeth County, Texas. We collected on the northwestern slope, in a

small, very steep canyon, some hundred feet below the peak (the elevation of which is 7,280 ft.). The vegetation was rather sparse in the habitat, and so were the snails. In several hours of search we found only 3 live specimens; one was crawling on the underside of a boulder we turned over, 2 others were copulating under another big rock. The ground was still moist from storms a few days before, and we expected to find more snails. It is possible that additional specimens would have been found at slightly higher elevations.

Ashmunella kochi sanandresensis, new subspecies

Plate I, Figures 3–3a; Figure 4c

Holotype USNM 701252, deposited in the collection of the United States National Museum of Natural History, Washington, D.C. Paratypes in the collection of the author. Type-locality: Western slope of San Andres Peak, San Andres Range, Doña Ana County, New Mexico.

Definition: *Ashmunella k. sanandresensis* includes those populations of the former *A. k. amblya* which live in the San Andres Range, but excludes those which live in the Guadalupe Mountains. The latter is synonymized here with *A. k. kochi*. The reason for this procedure is that the San Andres populations differ so much from the Guadalupe populations (Fig. 2a; Table 1) that they have to be treated as a separate taxonomic unit.

Material examined: 2 samples, 8–23 specimens each, 31 specimens altogether, from the collection of the Academy of Natural Sciences of Philadelphia and my own collection.

Description of shell: *Size and shape:* Width of shell 14.5–18.4 mm; spire flat or sometimes moderately elevated, very slightly convex or plane in contour; height 5.2–6.7 mm, height-width ratio, 0.34–0.42; last whorl slightly angular at left shoulder, gently ascending and then briefly but abruptly descending before aperture, constricted behind outer and lower lips.

Growth pattern: The 5.1–5.7 whorls increase gradually; coiling average in tightness, whorl-width ratio varies from 0.31–0.36; embryonic shell consists of 1.5–1.6 whorls.

Umbilicus: Narrows at beginning but suddenly expanding in last part of last whorl, reaching a diameter of 5.7–6.5 mm and an umbilicus-width ratio of .30–.38; however sudden this expansion may appear, it is less sudden than in the related species *A. auriculata*. This is shown by the fact that the first part of the umbilical diameter (U1, Fig. 2c) is nearly equal to the second part (U2), values for U1 being 2.2–3.4 mm and U2, 2.4–3.4, whereas in *A. auriculata* U2 values are definitely greater than U1 values.

Aperture: Rounded auricular or rounded angular above, round below, its plane concave and slanting down and backward when viewed from side; outer and lower lips reflected; lip swelling medium thick, receded in region above outer lip tooth, marginal below it, hence former region is sharp, latter, round.

TABLE 1. Comparison of some shell features of *Ashmunella auriculata* and 4 subspecies of *Ashmunella kochi*. Good distinguishing features are marked with an asterisk (*); weak ones with a dagger (†). Differences between *A. auriculata* and *A. kochi* ssp. are numerous and great, whereas among latter, relatively slight. Height/width and umbilicus/width ratios for *A. k. cornudasensis* are rated as weak distinguishing characters even though they do overlap comparable values of other taxa and thus appear as very good ones; sample of *A. k. cornudasensis* is composed of only 3 specimens and it is presumable that were sample larger, variation would be greater and there would be some overlap with other taxa.

Character	<i>A. k. kochi</i>	<i>A. k. cornudasensis</i>	<i>A. k. sanandresensis</i>	<i>A. k. caballoensis</i>	<i>A. auriculata</i>
Width in mm	15.9-21.5	17.9-18.2	14.5-18.4	15.3-20.5	11.5-12.9*
Height/width ratio	.30-.40	.41-.45†	.34-.42	.34	.35-.40
Growth pattern	last whorl suddenly widens (Fig. 2b)†	—	whorls gradually increasing	—	—
Whorl/width ratio	.25-.34	.29-.30	.31-.36	.28-.34	.40-.42*
Umbilicus	—	— rapidly expands in last part of last whorl	—	—	very rapidly expands in last part of last whorl*
Umbil./width ratio	.24-.34	.21-.23†	.30-.38	.26-.34	.30-.35
Left shoulder	slightly angular	angular*	—	slightly angular	—
Aperture shape	angular to triangular-auricular†	angular to auricular†	rounded angular to rounded auricular	round, round-angular to round-auricular	round-auricular to standing oval-auricular†

TABLE 1. Continued.

Character	<i>A. k. kochi</i>	<i>A. k. cornudasensis</i>	<i>A. k. sanandresensis</i>	<i>A. k. caballoensis</i>	<i>A. auriculata</i>
Outer lip tooth	medium large, variable in width	medium large, wide	medium large, rather narrow†	medium large, medium wide to wide	large, medium wide†
Constriction behind lips	— — — — —	— behind outer and lower lips only	— — — — —	— — — — —	behind upper, outer and lower lips* absent*
Fulcrum	medium to large	— — — — —	medium — — — — —	large to totally absent	absent*
Upper parietal lamella	usually absent, barely visible when present†	— — — — —	very weak and short — — — — —	very weak and short, sometimes only in traces	short and small†
Ascension of last whorl	— — — — —	— — — — —	very slight — — — — —	— — — — —	pronounced*

Armature: Consists of same elements as in *Ashmunella k. kochi*; outer lip tooth medium large, rather narrow, receded from margin of aperture, slanted down and inward; lower lip lamellae medium large although outer lamella usually slightly larger than inner; both protrude slightly from aperture, and there is often a spout between them formed by a protrusion of lower lip swelling; upper parietal lamella very weak and very short, sometimes only in traces, while lower one is moderate or strong and long; both converge inward but remain separate; fulcrum medium large.

Sculpture: Embryonic whorls covered from suture to suture with closely packed, fine striae many of which are broken up into long, transverse granules; exception is apex of shell which is smooth; on postembryonic whorls both striae and granules become more widely spaced, and on last whorls the granules gradually disappear.

Reproductive anatomy: *Ashmunella k. sanandresensis* is like *A. k. cornudasensis* in all features except that the lower section of the epiphallus is wider and has a much wider lumen with 4 ridges (Fig. 4c). This is remarkable since in shell features, especially in the height and the angularity of the last whorl the subspecies is closer to the nominal subspecies than to *A. k. cornudasensis*. It may be that the penis is contracted to a different degree in the dissected specimens, and this makes the difference.

Differential diagnosis: The distinguishing characteristics of the subspecies are summarized in Table 1.

Name: The name *sanandresensis* refers to San Andres Range where the subspecies occurs.

Distribution and ecology: *Ashmunella k. sanandresensis* is a geographic isolate of *A. kochi* (Fig. 3). It is known from 2 localities in the San Andres Range, both on the western slope of San Andres Peak (8,239 ft.), near Ropes Spring, 28 mi. northeast of Las Cruces, Doña Ana County, New Mexico. Pilsbry and Ferriss first found the snails in 1922; they collected in a ravine southeast of the spring, rather deep under stones; elevation was not given. I found the snails for the second time in 1967 at a locality far above the spring, at the foot of a low, north facing cliff, under small rocks, deep in the dirt, under brush oak; elevation was about 7,000 ft. The terrain generally was rocky, with sparse vegetation. Despite the heavy storm of a few days before, I found very few live specimens.

The specimens that Pilsbry and Ferriss collected are noticeably larger than the ones I found (16.5 versus 15.2 mm mean sample width). The reason for the size difference is not known.

***Ashmunella kochi caballoensis*, new subspecies**

Plate I, Figures 4–4a; Figure 4d

Holotype and one paratype deposited in the collection on the United States National Museum of Natural History, Washington, D.C., USNM

701253 and 706822, respectively. Other paratypes in the collection of the author. Type-locality: Brushy Mountain, Caballo Mountains, Sierra County, New Mexico.

Material examined: 1 sample, 30 specimens, from my collection.

Description of shell: *Size and shape*: Shell width 15.3–20.5 mm; spire moderately elevated or flat, sometimes so flat that right shoulder of last whorl is level with apex of shell when held horizontally; shell height 6.0–8.2 mm, height-width ratio, 0.34–0.46; last whorl round or slightly angular at left shoulder, at the most (as in the flattest specimens) slightly ascending and then briefly but abruptly descending before aperture, constricted by deep furrow behind outer and lower lips.

Growth pattern: The 5.2–5.7 whorls are evenly although fairly rapidly expanding; whorl-width ratio 0.28–0.34, coiling looser than average; embryonic whorls number 1.5–1.7.

Umbilicus: Narrow at beginning, but expanding suddenly in last part of last whorl reaching diameter of 4.0–7.0 mm; umbilicus-width ratio varies from 0.26 to 0.34.

Aperture: Round, rounded-angular or rounded-auricular above, round below; plane of aperture concave to varying degrees and slanting down and backward when viewed from side; outer and lower lips reflected; lip swelling medium thick or thick, receded in region above outer lip tooth while marginal below it, thus lips appear sharp in former region, round in latter.

Armature: Consists of 6 elements as usual in species; outer lip tooth medium large, moderately wide or wide, receded and often slanted down and inward; lower lip lamellae both large or very large with outer being usually larger than inner lamella; lip swelling often forms a spout between them; lower parietal lamella medium large or large and long, upper, small or very small and short, sometimes only present in traces; the two parietal lamellae converge inward but fuse only exceptionally; fulcrum may be large, small or totally absent.

Sculpture: Embryonic whorls smooth except below the suture where they bear very fine, regularly arranged striae; rest of shell with a somewhat coarser and more irregular striation.

Reproductive anatomy: Agrees in all essential features with *Ashmunella k. cornudasensis* (Fig. 4d); the differences are that one of the 3 internal ridges is slightly subdivided in the lower region of the epiphallus, and that the penis has very thick walls and 6–7 small ridges.

Differential diagnosis: The distinguishing features of the subspecies are summarized in Table 1.

Name: The name *caballoensis* refers to Caballo Mountains, the type-locality of the taxon.

Distribution and ecology: *Ashmunella k. caballoensis* is a geographic isolate of its species (Fig. 3). It occurs only on Brushy Mountain, Caballo Mountains, New Mexico. We collected it on the north face just below the peak, at an elevation of about 7,200–7,300 ft. The snails live under the small, loose rocks and dirt that accumulated at the foot of the huge

cliffs forming the peak. The vegetation was sparse with juniper, brush oak, creosote, yucca, etc. being the more conspicuous elements. The soil was still wet from the rains that fell a few days before our visit, yet we only could find 18 live, adult specimens, most of them deep underground. Empty shells were abundant.

Taxonomy of Ashmunella kochi: The species as defined here consists of 4 subspecies, 3 of which are newly described, while the remaining one, the nominal subspecies, is the result of the synonymization of 2 previously recognized taxa. Considering that the 4 taxa recognized as valid in this paper are but geographic isolates of the same entity, each with some morphological distinction, some investigators may wish to rank them as separate full species. My reasons for treating them as conspecific subspecies are 2. First, the 4 taxa in shell features differ from one another less than any one of them does from other, related forms, e.g. *A. auriculata*. Second, the differences in reproductive anatomy between them are minute.

***Ashmunella auriculata*, new species**

Plate I, Figures 5–5a

Holotype USNM 701254, deposited in the collection of the United States National Museum of Natural History, Washington, D.C. Paratypes in the collection of the author. Type-locality: Boulder Canyon, Organ Mountains, Doña Ana County, New Mexico.

Material examined: 1 sample, 13 specimens, from my own collection.

Description of shell: *Size and shape*: Width of shell 11.5–12.9 mm; spire flat, sometimes so much so that ascending portion of last whorl may be higher than apex when shell is held horizontally; spire very slightly convex or plane in outline; height of shell 4.3–5.0 mm, height-width ratio 0.35–0.40; last whorl slightly angular at left shoulder, ascending decidedly and then descending abruptly before aperture, constricted from suture to suture behind lips.

Growth pattern: The 4.8–5.3 whorls increase slowly, gradually; coiling moderately tight; whorl-width ratio ranges from 0.40 to 0.42; embryonic shell consists of 1.5–1.6 whorls.

Umbilicus: Narrow at beginning but suddenly very greatly expanding in last part of last whorl which renders it oval shaped, and makes diameter of last part of umbilicus greater than that of first part (Fig. 2c, U2 and U1 values); umbilical diameter 3.5–4.4 mm, U1 values 1.3–1.9 mm, U2, 2.1–2.6 mm; umbilicus-width ratio 0.30–0.35

Aperture: Rounded-auricular or standing oval-auricular above, round below, its plane concave in side view and slanted down and backward; lips reflected all around; lip swelling medium thick, marginal or slightly receded above outer lip tooth, marginal or protruding below it, hence lips are sharp in former region, round or bulging in latter.

Armature: Composed of 5 elements: outer lip tooth, moderately wide and high, sometimes bicuspid, slightly or deeply receded and

slanted down and inward; outer and inner lamellae on lower lip, medium large, or large, sharp blade protruding from aperture; often a spout between them formed by protrusion of lower lip swelling; upper parietal lamella short and weak, lower parietal lamella very strong and long; they converge inward but do not fuse at their inner end. The fulcrum which forms the sixth element in the armature of the related species *A. kochi* is missing.

Reproductive anatomy: Unknown. There are no live specimens available for study.

Similarities and differential diagnosis: *Ashmunella auriculata* closely resembles *A. kochi* in apertural features. However, the high whorl-width ratio, the pronounced ascension of the last whorl upon the penultimate one, the suture-to-suture constriction behind the completely reflected lips, the oval umbilicus, the standing oval-auricular aperture and the absence of the fulcrum are more than enough to distinguish this species from any of the 4 subspecies of *A. kochi* (Table 1).

Taxonomy: Considering that in apertural features *Ashmunella auriculata* is similar to *A. kochi*, and that it is isolated but occurs near the area of one of the subspecies of *A. kochi*, *A. k. sanandresensis*, some malacologists may wish to consider it just another subspecies of that species. As the great number of distinguishing features listed above indicates, however, *A. auriculata* is more different from any subspecies of *A. kochi* than the latter are from each other. Therefore, it seems best to rank it as a full species. While the facts that the ascension of the last whorl, the shape of the umbilicus and that of the aperture may be correlated characters (and a slight ascension also is noticeable in some specimens of *A. kochi*) weaken this conclusion somewhat, they do not seem to invalidate it.

Name: The name *auriculata* refers to the shape of the aperture, which is more auricular than in related species.

Distribution and ecology: *Ashmunella auriculata* is a geographic isolate of the *A. kochi* group. To date it has been found only in Boulder Canyon, in the southern part of Organ Mountains, about 14 mi. east of Las Cruces, Doña Ana County, New Mexico (Fig. 3). The snails were found in the narrow upper part of the canyon, at about 6,500–6,800 ft. of elevation, under dirt and small rocks that accumulated at the foot of the precipitous eastern wall of the canyon. The cliffs provided some shelter, but otherwise the canyon was exposed to the scorching sun and was very dry and barren.

The discovery of *Ashmunella auriculata* in Organ Mountains was surprising since another species of *Ashmunella*, namely *A. organensis* of Pilsbry, was already reported from there, and only a small area is involved. I first assumed that some error was made in labelling the localities, and checked both my collection and Pilsbry's field book. I have found some discrepancies and some data are missing from the latter; nevertheless, the localities appear correct. Thus it seems that 2 species of *Ashmunella* occur in Organ Mountains.

Ashmunella macromphala, new species

Plate I, Figure 7; Figure 5a

Holotype and 1 paratype deposited in the collection of the United States National Museum of Natural History, Washington, D.C., USNM 701256 and 706823, respectively. Other paratypes in the collection of the author. Type-locality: Cooks Peak, Luna County, New Mexico.

Material examined: 1 sample, 30 specimens, from my collection.

Description of shell: *Size and shape*: Width of shell 12.5–14.9 mm; spire flat or sometimes moderately elevated, plane or slightly convex in outlines; height of shell 5.4–6.5 mm, height-width ratio 0.40–0.51; last whorl slightly angular or angular on left shoulder, briefly descending before aperture, constricted by deep furrow behind lips in region of outer lip tooth and below it.

Growth pattern: The 5.0–5.4 whorls are evenly expanding and moderately tightly coiled; remarkably, the whorl number varies independently of the width of the shell (Fig. 2a), whereas usually the two characters are positively correlated: It is possible, however, that correlation would become evident if more samples were studied; whorl-width ratio 0.35–0.43; embryonic shell has 1.5–1.6 whorls.

Umbilicus: Wide from very beginning so that one can see underside of first whorls; in last part of last whorl umbilicus widens even more, reaching a diameter of 2.7–4.3 mm, and an umbilicus-width ratio of 0.21–0.29.

Aperture: Round, rounded-angular or rounded-auricular above, round below; its plane slanted down and backward, concave in side view, sometimes pronouncedly so; lips reflected in region of outer lip tooth and below it, thus paralleling extent of constriction behind lips; lip swelling medium thick at most, receded above outer lip tooth, marginal below it, therefore lip appears sharp in former region while round in latter.

Armature: Consists of 5 elements: outer lip tooth, medium large and medium wide or wide, receded and slanted down and inward; outer and inner lower lip lamellae both medium large although outer usually somewhat larger than inner; lower lip often bears a spout-like protuberance between these two lamellae; fourth and fifth elements are 2 parietal lamellae which converge inward although remaining separate along their entire length; upper parietal lamella very short and small, sometimes only in traces; lower parietal lamella medium large and long.

Sculpture: Embryonic whorls completely covered with fine, closely packed striae which sometimes break up into long transverse granules; post embryonic whorls bear a similar sculpture except that striae are somewhat coarser and more widely spaced.

Reproductive anatomy: The long epiphallus, the vestigial flagellum and the long, cylindrical spermatheca are typical ashmunelloid features (Fig. 5a). The inner structure of the epiphallus is characterized by 3 longitudinal ridges which run through its entire length. The distinguishing features are: the hermaphroditic gland is not subdivided; the

penial retractor is attached to a long section of the epiphallus above the penis, thus contraction of the retractor muscle forces the epiphallus into at least 2 loops; the penis sac is quite large in comparison to the vagina, its wall is relatively thin and its lumen wide, with 2 major and 7 or 8 minor internal ridges; the atrium is small.

Similarities and differential diagnosis: In regard to the aperture and the armature, *Ashmunella macromphala* is very similar to *A. kochi*. Its main distinguishing feature is the umbilicus which is wide throughout whereas in the *A. kochi* group it is narrow at the beginning and wide only in the last part of the last whorl. In the structure of the epiphallus, too, an agreement exists between the 2 species. The large penis clearly distinguishes *A. macromphala* from the *A. kochi* group. In fact, the shape and structure of the penis somewhat resembles that of *A. mogollonensis* (Pilsbry 1940, Fig. 524:3).

Taxonomy: *Ashmunella macromphala* is considered a full species because of the distinguishing features in its shell and in its reproductive anatomy, and because of its isolated distribution. Its nearest relatives appear to be the members of the *A. kochi* group, with which it shares apertural features and epiphallic structure, and possibly *A. mogollonensis*, with which it agrees in some features of the penis.

Name: The name *macromphala* refers to the most distinguishing feature of the species, the large umbilicus.

Distribution and ecology: *Ashmunella macromphala* is only known from Cooks Peak, New Mexico (Fig. 3). We collected the snails on the very steep northern slope of the peak, at about 6,900–7,000 ft. of elevation, at the edge of 2 huge rock slides, from under the rocks and the debris accumulated between them. Groups of oak bordered the rock slides, providing food and shelter for the snails. The debris was dry, it did not rain for weeks prior to our visit; yet we found 80–90 live adult snails at one of the rock slides. At the other, which was located merely a quarter of a mile to the east, we only found 20–30 empty shells.

***Ashmunella animasensis*, new species**

Plate I, Figure 8

Holotype USNM 701282, deposited in the collection of the United States National Museum of Natural History, Washington, D.C. Paratype in the collection of the author. Type-locality: Animas Peak, Hidalgo County, New Mexico.

Material examined: 1 sample, 2 specimens, from my own collection.

Description of shell: *Size and shape:* Width of shell 11.9–12.0 mm; spire moderately elevated and slightly convex in contours; height of shell 5.4–6.0 mm, height-width ratio 0.45–0.50; last whorl slightly angular on left shoulder, very slightly descending before aperture, constricted by a deep furrow behind lips below right shoulder.

Growth pattern: The 6.1–6.2 whorls increase very slowly, gradually, coiling very tight, whorl-width ratio in both shells 0.51; embryonic shell consists of 1.4 whorls.

Umbilicus: Narrow at beginning but suddenly expanding in last part of last whorl, its diameter here reaches 2.3–2.4 mm; umbilicus-width ratio 0.19–0.20.

Aperture: Rectangular or auricular-rectangular, its plane slanted down and backward and hardly concave in side view; outer and lower lips reflected; lip swelling medium thick, receded in upper lip, nearly marginal in outer, and slightly protruding in lower; therefore upper lip is sharp, the outer and lower, round.

Armature: Consists of 1 tooth in outer lip, 2 in lower, and 1 lamella on parietal wall; outer lip tooth low but very wide, sometimes bifid, slightly receded and slanted down and inward; outer lip tooth of lower lip medium sized, inner lip tooth a small structure, both situated near middle of lower lip; lip swelling protrudes between them like a spout; parietal lamella moderately or strongly developed, straight; it corresponds in position to lower parietal lamella of the *Ashmunella kochi* group.

Sculpture: The 2 shells available for description are somewhat worn and therefore fine details of the sculpture are difficult to discern; but apparently the sculpture solely consists of fine striae both on the embryonic and postembryonic whorls.

Reproductive anatomy: Not known.

Relationships and differential diagnosis: *Ashmunella animasensis* is most similar to *A. proxima* of the Chiricahuas in size and coiling pattern, but to *A. pilsbryana* of the Mogollons, in apertural features. The true relations are probably to the Chiricahua species, because that range lies only 25 mi. from Animas Peak, whereas the Mogollons are about 120 mi. away.

Ashmunella animasensis is not identical with *A. tetrodon animorum* of Pilsbry and Ferriss, 1917.

Name: The name *animasensis* refers to Animas Peak, where the species was discovered.

Distribution and ecology: *Ashmunella animasensis* is restricted to Animas Peak, New Mexico (Fig. 3). It is a geographic isolate, presumably of *A. proxima* which lives in the nearby Chiricahua Mountains. The collecting site was on the western side of Animas Peak (8,519 ft.), somewhat below the summit, at an estimated elevation of 7,500–8,000 ft. Pine, oak and juniper grew in abundance on the slope, indicating a fair amount of precipitation. At the time of our visit, however, everything was dry. We had to dig about 2 ft. in loose dirt and rock before we found a couple of live adult specimens and a few empty shells.

***Ashmunella salinasensis*, new species**

Plate I, Figure 9; Figure 5b

Holotype USNM 701257, deposited in the collection of the United States National Museum of Natural History, Washington, D.C. Paratypes in the collection of the author. Type-locality: Salinas Peak, Socorro County, New Mexico.

Material examined: 1 sample, 20 specimens, from my collection.

Description of shell: *Size and shape:* Width of shell 12.9–14.6 mm; spire flat or moderately elevated, its contours plane or very slightly convex; height of shell 6.0–7.3 mm, height-width ratio 0.44–0.51; last whorl slightly angular on left shoulder, very slightly descending before aperture, constricted behind lips; constriction very shallow near origin of upper lip (where latter fuses with parietal wall), considerably deeper elsewhere.

Growth pattern: The shell is formed by 4.8–5.2 gradually to rather rapidly expanding whorls; coiling moderately tight, whorl-width ratio 0.35–0.38; embryonic shell has 1.3–1.6 whorls.

Umbilicus: Narrow at beginning but suddenly expands in last part of last whorl where its diameter is 2.8–3.8 mm; umbilicus-width ratio varies between 0.22 and 0.28.

Aperture: Round, rounded-rectangular or rounded-auricular above, round below, its plane slanted down and backward, exceptionally with slight concavity in region of outer lip tooth when viewed from side; upper lip slightly, the outer and lower, very much reflected; lip swelling medium thick or thick, running near edge of lips except near origin of upper lip where receded, hence lips swollen except in latter region where sharp.

Armature: Consists of 3 elements: outer and lower lip teeth and parietal lamella; outer lip tooth has degenerated into a barely recognizable thickening of lip swelling or completely disappeared; lower lip tooth is a minuscule protuberance or again may be completely absent; parietal lamella, corresponding to lower parietal lamella of *A. kochi*, may be very short and low, may be present in traces or may be completely absent; about $\frac{2}{3}$ of specimens have no armature at all.

Sculpture: Embryonic whorls ornamented with fine striation except on smooth apex; some striae may break up into rows of long, transverse granules; this pattern persists for first 2 or 3 postembryonic whorls; thereafter moderately strong ribs replace striae, numbering 33–39 on last whorl.

Reproductive anatomy: Spermatheca long, cylindrical, without a terminal sac, epiphallus long, and flagellum vestigial, as usual in *Ashmunella* (Fig. 5b). Upper epiphallus characterized internally by 3 longitudinal ridges and several minute wrinkles, which features occur in many congeners. However, spermatheca is unusually swollen (had the specimen just mated?) and middle region of epiphallus has a section about 3.7 mm long inflated to about $1\frac{1}{2}$ times normal diameter with walls and 3 internal ridges being stretched out thin; particularly, this latter feature is distinctive. Penis has 3 major, subdivided ridges and 4–6 minor ones.

Similarities and differential diagnosis: *Ashmunella salinasensis* is very similar in shell features to the *A. rhyssa* group. It is distinguishable from the latter by its smaller and flatter shell and much wider umbilicus. Anatomically it is difficult to relate to any group; the inflation of the middle epiphallus is a unique feature. It is fair to say that nothing in

the anatomy contradicts the conclusion concerning its relationships reached on conchological grounds.

Taxonomy: On the basis of its isolated distribution and moderate degree of distinction in shell morphology, *A. salinasensis* could be ranked either as a subspecies of *A. rhyssa* or as a separate species. Its uniqueness in anatomical features lends support to the latter alternative.

Name: The name "*salinasensis*" refers to Salinas Peak where the species was found.

Distribution and ecology: *Ashmunella salinasensis* is a geographic isolate of the *A. rhyssa* group (Fig. 3). It occurs solely on Salinas Peak (8,958 ft.), New Mexico, while the *A. rhyssa* group is widespread in the Sierra Blanca Mountains, about 35 mi. to the east. The collecting site was on the northern slope of the peak, near the summit, at about 8,500–8,800 ft. elevation. The road leading to the summit was met here by the upper end of a huge rock slide. Several groups of oak trees occurred at the edge and inside the rock slide, forming small green islands on the otherwise barren mountainside. We found many live snails in these patches, under rocks in the dirt and litter. We also collected at another rock slide further down along the road, at about 7,200–7,800 ft. elevation on the northwestern slope, but there found only *Sonorella*.

***Ashmunella pasonis polygyroidea*, new subspecies**

Plate I, Figure 10

Holotype USNM 701225, deposited in the collection of the United States National Museum of Natural History, Washington, D.C. Paratypes in the collection of the author. Type-locality: Franklin Mountain, El Paso County, Texas.

Material examined: 1 sample, 3 specimens, from my collection.

Description of the shell: *Size and shape:* Width of shell 14.1–14.8 mm; spire nearly or completely flat, plane or very slightly convex in outline; height of shell varies from 4.9 to 5.1 mm, height-width ratio 0.34–0.35; last whorl angular at left shoulder, ascending and then briefly but very abruptly descending before aperture, with deep constriction behind outer and lower lips, with a shallow constriction or none behind upper lip.

Growth pattern: The 5.0–5.1 whorls expand slowly, gradually; coiling moderately tight, whorl-width ratio 0.34–0.36; embryonic shell consists of 1.4–1.5 whorls.

Umbilicus: Very narrow at beginning, but expands rapidly in last part of last whorl, reaching diameter of 4.3–4.6 mm; umbilicus-width ratio varies from 0.30–0.32.

Aperture: Round or rounded-auricular above, round below, its plane slanted down and backward, deeply concave in region of outer lip tooth; upper lip moderately reflected, outer and lower ones more so; lip swelling moderately thick or thick, receded above outer lip tooth, marginal below.

Armature: Unique in that dentition resembles that of *Ashmunella kochi*, while parietal features resemble those of *A. pasonis*. Thus, upper lip toothless, outer lip bears a tooth, and lower lip bears 2 lamellae; outer lip tooth medium large, medium wide, situated near right upper corner of aperture, slightly receded and slanted down and inward; outer lamella of lower lip medium large or large, inner lamella small or medium large; both rather short, in 1 specimen so much so that they resemble teeth (i.e. tubercles) more than lamellae (i.e. folds perpendicular to the peristome); both situated far away from origin of lower lip (where lip joins parietal wall), thus outer lamella is quite close to outer lip tooth; parietal wall features a callus, roughly triangular in shape, slightly raised at its frontal edge; lower boundary of callus formed by a very large lamella which runs in a straight line from near origin of lower lip across parietal wall towards outer lip tooth; upper boundary formed by a slight thickening which fuses with lower lamella at its inner end; a short fulcrum situated about 0.2 whorls behind aperture inside last whorl. It must be emphasized here that a parietal callus is characteristic of the related genus *Polygyra*, but it is extraordinary in *Ashmunella*.

Sculpture: The embryonic shells are worn in all specimens hence their sculpture cannot be described with certainty; they appear to be smooth with short striae near the sutures; the rest of the shell bears fine striation; no granules or scales are discernible.

Reproductive anatomy: Not known.

Similarities and differential diagnosis: *Ashmunella pasonis polygyroidea* resembles *A. k. sanandresensis* in size, shape, growth pattern, sculpture and dentition, and *A. p. pasonis* (Plate I, Fig. 11) in parietal features. This combination is unique and it distinguishes the subspecies from any other form of *Ashmunella*.

Evolution and taxonomy: The newly recognized form presumably originated by hybridization between *A. p. pasonis* and *A. k. sanandresensis*, or some other subspecies of *A. kochi*. The former of the putative parents lives in Franklin Mountain, the latter, in the San Andres Range, near enough to allow hybridization. The assumption that hybridization occurred is based on the fact that the new subspecies combines features from each of its putative parents. This contention has not been substantiated by statistical analysis or breeding experiments. The small number of shells available for study prevents a statistical treatment; the breeding experiments so far undertaken have not yielded any results since neither inter- nor intraspecific matings were observed (4 experiments, each involving 19–32 specimens). Alternative explanations also are possible.

Whether or not the newly described form originated through hybridization, it is best to classify it as a subspecies of *A. pasonis*. The latter is the only other form of *Ashmunella*, beside the taxon under discussion, which has a polygyroid parietal lamella, and the conspecific status would bring out this fact. Furthermore, both of the *Ashmunella pasonis* subspecies occur in the same mountain, separated by

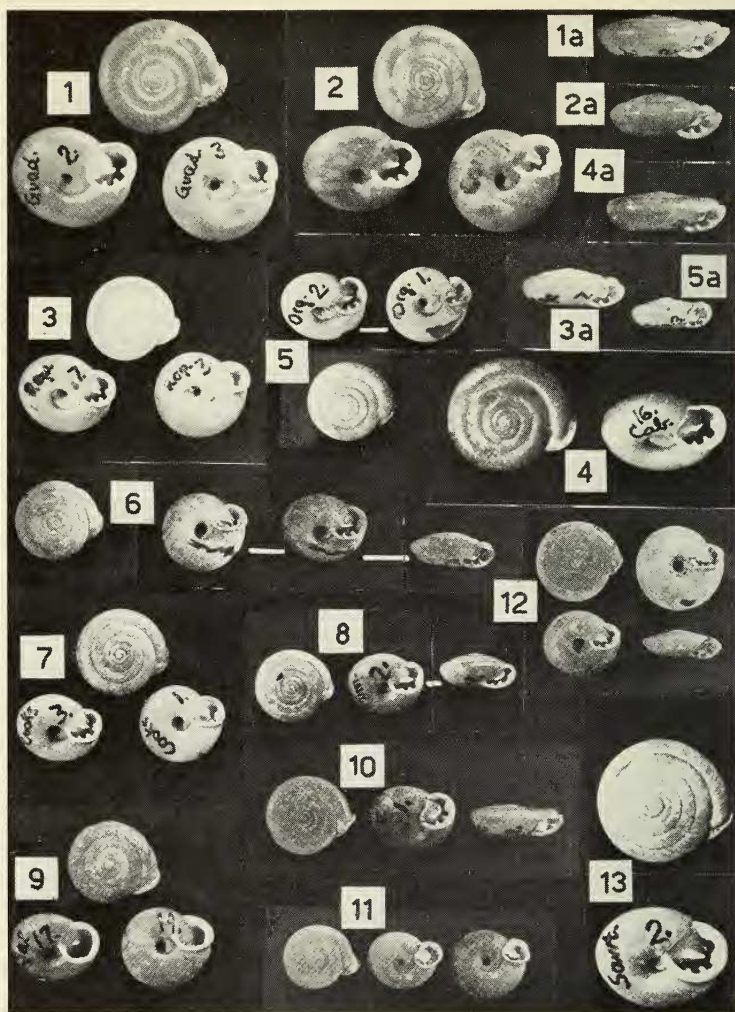


PLATE I. 1-1a, *Ashmunella k. kochi*, Guadalupe Mountains, Texas, $\times .82$; 2-2a, *Ashmunella k. cornudasensis*, Cornudas Mountains, New Mexico, $\times .82$; 3-3a, *Ashmunella k. sanandresensis*, San Andres Range, New Mexico, 3, $\times .82$, 3a, $\times .88$; 4-4a, *Ashmunella k. caballoensis*, Caballo Mountains, New Mexico, 4, $\times .88$, 4a, $\times .82$; 5-5a, *Ashmunella auriculata*, Organ Mountains, New Mexico, 5, $\times .93$, 5a, $\times .88$; 6, Undescribed *Ashmunella* from Chisos Mountains, Texas, $\times .82$; 7, *Ashmunella macromphala*, Cooks Peak, New Mexico, $\times .88$; 8, *Ashmunella animasensis*, holotype and paratype, Animas Peak, New Mexico, $\times .88$;

only a few miles from one another, and it appears most unlikely that 2 forms of *Ashmunella* could acquire a polygyroid parietal callus and occur near one another without being related to one another. It seems less logical to consider the new subspecies conspecific with the other putative parent, *A. k. sanandresensis*, because it is more isolated geographically from the latter form. In light of the above arguments, it also appears illogical to rank it as a full species. Still another possibility is to leave the subspecies, a presumed hybrid, without any taxonomic recognition. However, the taxon does deserve some recognition because it has some geographic isolation and thus an evolutionary potential with already acquired morphological distinction.

The occurrence of a parietal callus in both *Ashmunella pasonis polygyroidea* and the analogous *A. p. pasonis* poses another evolutionary problem. As it has been pointed out earlier, a parietal callus is not known in any other form of *Ashmunella* while it is characteristic of the related genus *Polygyra*. It may be that intergeneric hybridization is involved, or that independent evolution brought about this phenomenon; this problem is not solved at the present time. It may be added that *A. p. pasonis* resembles *Polygyra* in the location of the lip teeth and the development of the whole peristome region as well, which facts may lend some more credence to the assumption of intergeneric hybridization.

Name: The name *polygyroidea* has been chosen to express the similarity of the subspecies to the genus *Polygyra* in apertural features, especially in regard to the parietal callus.

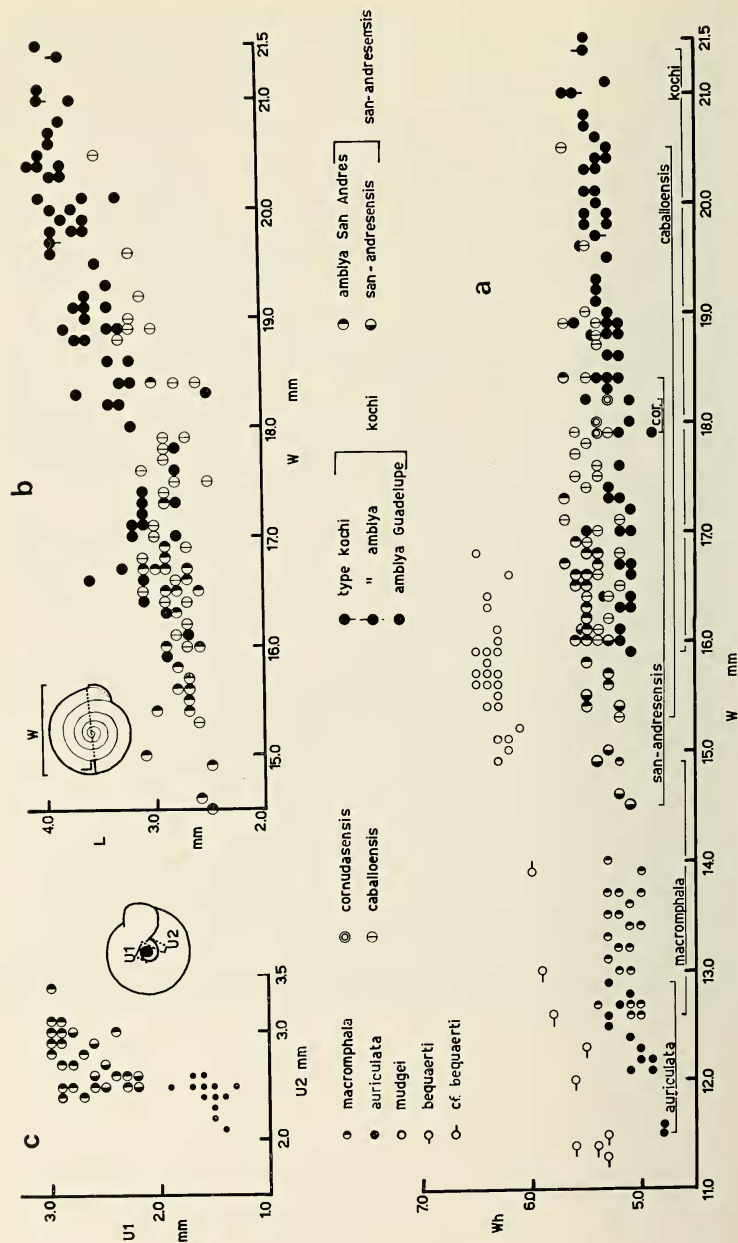
Distribution and ecology: *Ashmunella pasonis polygyroidea* is only known from Franklin Mountain, just north of El Paso, Texas (Fig. 3). We collected in a large canyon on the east side of the mountain, above Cottonwood Spring, at an elevation of about 6,000 ft., under the rocks of a rock slide on the north-facing slopes; the vegetation was very sparse. We only found a few empty shells.

Reproductive anatomy of Ashmunella bequaerti, mudgei and A. p. pasonis: These taxa are not new to science. Cheatum described the former in 1971 as a full species, *A. mudgei*; Drake described the latter in 1951 also as a full species, *Polygyra pasonis*. Neither author described the anatomy of the reproductive organs, however.

Reproductive anatomy of Ashmunella b. mudgei: The spermatheca is cylindrical, the flagellum very small, attached, and the epiphallus, long as usual in *Ashmunella* (Fig. 5c). The upper portion of the epiphallus has 1 major and 7–9 minor ridges, which pattern is rather unusual. The

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9, *Ashmunella salinasensis*, Salinas Peak, New Mexico, $\times .88$; 10, *Ashmunella pasonis polygyroidea*, Franklin Mountain, Texas, $\times .82$; 11, *Ashmunella p. pasonis*, Franklin Mountain, Texas, $\times .82$; 12, *Ashmunella b. bequaerti*, Davis Mountains, Texas, $\times .93$; 13, *Ashmunella b. mudgei*, Davis Mountains, Texas, $\times 1.1$.



middle epiphallus has 3 thin, large ridges and 6–8 small ones; the penis has 1 very large ridge, 1 intermediate in size and about 10 very small ones.

Reproductive anatomy of Ashmunella p. pasonis: This taxon was originally described as a *Polygyra*, based on shell features, which indeed are very much more those of a *Polygyra* than an *Ashmunella* (Drake, 1951). Soon after its description, the taxon was transferred to the genus *Ashmunella* by Drake (1952) who cited Wendell O. Gregg's observation that anatomically the taxon belongs to *Ashmunella*. Gregg's observations have not been published, however, thus the position of the taxon has remained somewhat uncertain. As the description below will show, the taxon indeed belongs to *Ashmunella*.

The spermatheca, the flagellum and the epiphallus are as characteristic in *Ashmunella* (Fig. 5d). The upper epiphallus shows 3 major ridges and several wrinkles in cross section, which is also a common feature in the genus. The middle epiphallus has, however, 2 of the major ridges subdivided and has in addition a small ridge. The penis is very large, blunt, and horseshoe-shaped.

The conspecificity of Ashmunella bequaerti and A. mudgei: The two forms in question were originally described as separate species (Clench and Miller, 1966; Cheatum and Fullington, 1971). Considering the great degree of morphological difference between them, their at least

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FIG. 2. Variation of width, whorl number, umbilicus and width of last whorl in 4 species of *Ashmunella*. a, Scatter diagram of variation in width (W) vs. whorl number (Wh) in *Ashmunella kochi*, *A. auriculata*, *A. macromphala* and *A. bequaerti*. Symbols as explained in diagram; horizontal lines indicate range of variation; one dot may represent more than one specimen. Note how close the type of *A. k. amblya* is to those of *A. k. kochi*; this is the reason for synonymizing it with the latter. Also note the lack of correlation between width and whorl number in *A. macromphala*. b, Scatter diagram of variation in width of last whorl (L) vs. width of shell (W) in *A. k. kochi*, *A. k. sanandresensis* and *A. k. caballoensis*. Symbols as above, except that a common sign is used for specimens of *A. k. sanandresensis*. Note that while there is an overlap between the smaller specimens of the nominal subspecies and specimens of the other 2 taxa, the larger specimens of *A. k. kochi* have a relatively wider last whorl (i.e. the regression curve of *A. k. kochi* is steeper than that of the 2 other taxa). The great size of these specimens is due to the disproportionately wide last whorl not to more whorls (cf. Fig. 2a). c, Scatter diagram of variation in diameter of first and last part of umbilicus (U1 vs. U2) in *A. k. sanandresensis* and *A. auriculata*. Measurements as explained on the diagram; symbols as explained above. The more the umbilicus expands in the last part of the last whorl, the greater the U2 value becomes relative to U1, as in *A. auriculata*.

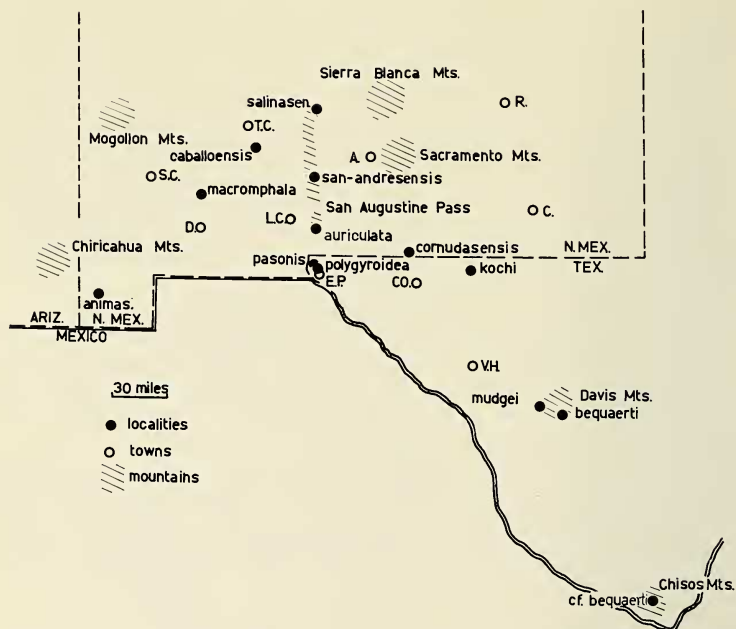
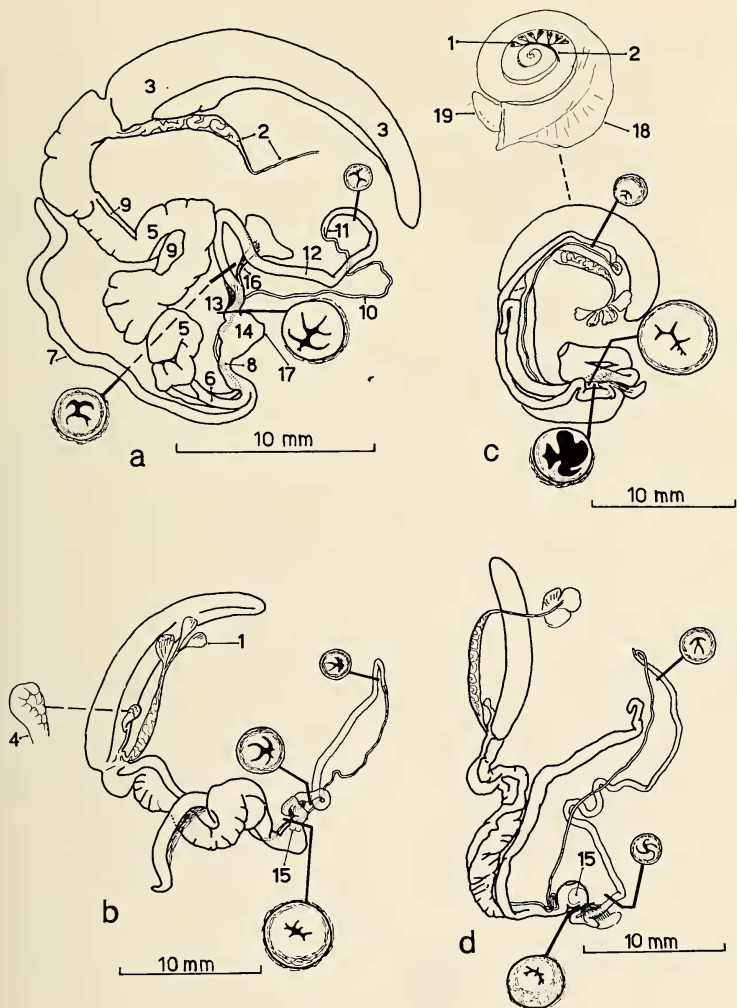


FIG. 3. Distribution of *Ashmunellas* described or discussed in text. Symbols as shown in figure. Abbreviations: A., Alamogordo; C., Carlsbad; CO., Cornudas; D., Deming; E.P., El Paso; L.C., Las Cruces; R., Roswell; S.C., Silver City; T.C., Truth or Consequences; V.H., Van Horn; other abbreviations are of states. Note: not all mountain ranges are shown in area.

partial geographic isolation, and the lack of evidence for interbreeding, this procedure was logical. The discovery of a shell in the USNM collection (USNM 251921) has, however, changed this picture. This shell (Plate I, Fig. 6) contains a mixture of the characteristics of the two forms under discussion thus bridging the gap between them. Because of practical reasons, formal taxonomic recognition is not extended to this shell (or to the taxon of which it is a sample); but a somewhat shortened description of the properties of this shell is presented here.

FIG. 4. Anatomy of reproductive organs of *Ashmunellas* described or discussed in text. a, *Ashmunella k. kochi*, Guadalupe Mountains, Texas; b, *Ashmunella k. cornudasensis*, Cornudas Mountains, New Mexico; c, *Ashmunella k. sanandresensis*, San Andres Range, New Mexico; d, *Ashmunella k. caballoensis*, Caballo Mountains, New Mexico. Insets



show sections of the epiphallus and penis sac made where indicated by heavy lines; additional inset to Fig. 4b shows enlargement of the talon, to Fig. 4c, location of the hermaphroditic gland *in situ*. 1, hermaphroditic gland; 2, hermaphroditic duct; 3, albumen gland; 4, talon; 5, uterus; 6, oviduct; 7, spermatheca; 8, vagina; 9, prostate; 10, vas deferens; 11, flagellum; 12, epiphallus; 13, penis sac; 14, atrium; 15, penis; 16, penis retractor; 17, genital orifice; 18, mantle; 19, foot; 20, eye. Note: the insets were drawn under $20\times$ magnification; their dimensions are proportionate in relation to one another, but not to the rest of the diagrams.

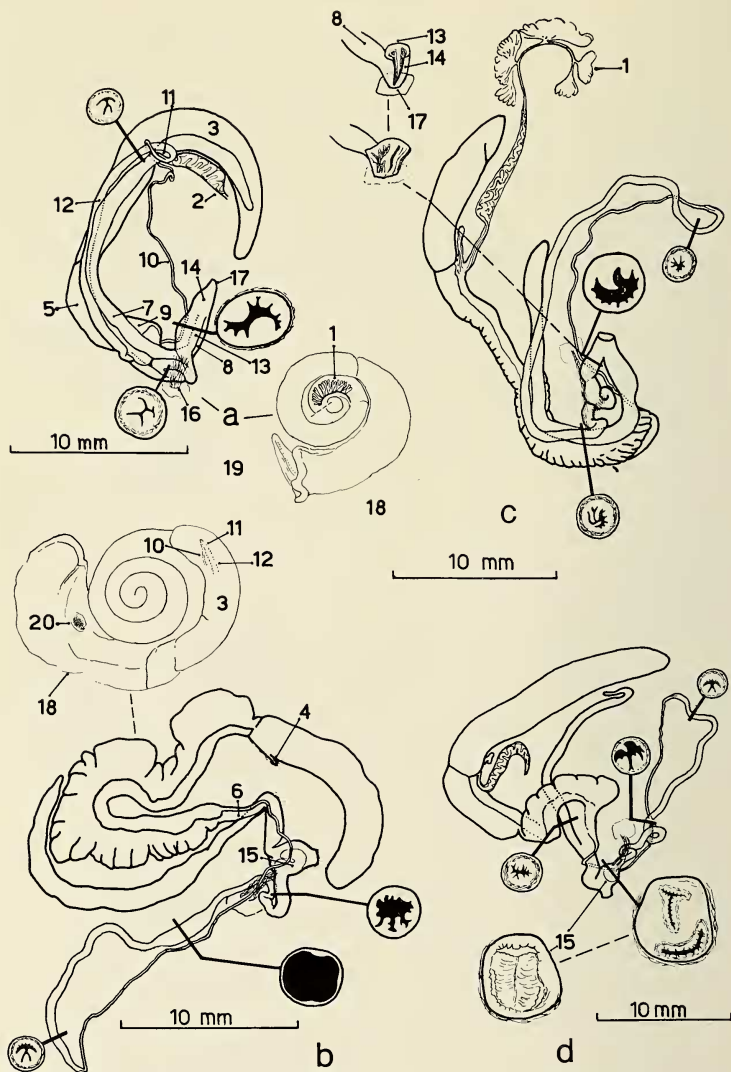


FIG. 5. Anatomy of reproductive organs of *Ashmunellas* described or discussed in text. a, *Ashmunella macromphala*, Cooks Peak, New Mexico; b, *Ashmunella salinasensis*, Salinas Peak, New Mexico; c, *Ashmunella b. mudgei*, Sawtooth Mountain, Davis Mountains, Texas; d, *Ashmunella p. pasonis*, western side of Franklin Mountain, Texas. Insets show sections of the epiphallus, penis sac and penis made where indicated by heavy lines. Additional inset to Fig. 5a shows the soft body,

Width of shell 13.9 mm; spire flat and convex in outline; height 5.7 mm; last whorl keeled on left shoulder; whorl number 6.0, coiling tight. Umbilicus wide at beginning so that underside of first whorls can be seen from below; umbilical diameter in last whorl 3.4 mm.

Aperture angular above, round below; upper lip slightly, outer and lower, widely reflected; lip swelling moderately thick; outer lip tooth high and very wide, outer lamella of lower lip large, inner lamella, medium large; upper parietal lamella very thin and long, lower lamella strong and long.

The sculpture can only be tentatively described because the shell of the only available specimen is somewhat worn; the embryonic whorls seem to have only granules, packed tightly, the first postembryonic whorls bear both granules and striae, and the last whorl, only striae.

As can be seen from the foregoing description, the shell in question is similar to *A. mudgei* (Plate I, Fig. 13) in shape, sculpture and growth pattern (Fig. 2a). It does not have, however, the exceedingly heavy lip swelling and lower parietal lamella characteristic of that form, its umbilicus is wide at the beginning whereas that of *A. mudgei* is narrow, and it is somewhat smaller than the latter. At the same time, this shell in question agrees with *A. bequaerti* (Plate I, Fig. 12) in the formation of the umbilicus, but lacks the more compressed, carinated shape, more angular aperture, very widely separated parietal lamellae and predominantly granular sculpture of that form.

As to the locality of the shell in question, the museum label reads: "Chisos Mts., Texas, V. Bailey." This certainly is possible but it has to be pointed out that Chisos Mountains lie outside the known area of distribution of the genus and that several collectors who worked in the Chisos Range have failed to find any *Ashmunella* there. Thus this locality report may be in error. It is possible though that future collecting will disclose the species in the Chisos Range. This range is sizeable and it provides a variety of habitats some of which appear suitable for *Ashmunella*. (The range lies in the Big Bend National Park, Brewster County, Texas; highest point is Emory Peak, 7,777 ft.)

Whether this shell in question comes from Chisos Range or from Davis Mountains, where both *A. bequaerti* and *A. mudgei* occur, its significance is in the fact that it provides a mixture of the morphological characters of these two species and thereby it indicates their conspecificity.

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with the shell broken away and the apical $2\frac{1}{2}$ whorls removed to expose the hermaphroditic gland *in situ*; to Fig. 5b, the intact soft body with the shell broken away, and the position of the albumen gland and the tip of the epiphallus with the flagellum *in situ*; to Fig. 5c, the atrium, partially and completely opened; and to Fig. 5d, the tip of the penis as seen from the genital orifice.

Therefore, I propose that their taxonomic rank be changed from species to subspecies, and their names be *A. b. bequaerti* and *A. b. mudgei*.

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